



## EPA Region 7 TMDL Review

**TMDL ID:** MO-3203, MO-3216, MO-3217  
**Waterbody ID:** MO-3203, MO-3216, MO-3217  
**Waterbody Name:** Center Creek, Turkey Creek (2)  
**Tributary:**  
**Pollutant:** Zinc  
**State:** MO  
**HUC:** 11070207  
**BASIN:** Spring River  
**Submittal Date:** September 25, 2006  
**Approved:** yes

### Submittal Letter

*State submittal letter indicates final TMDL(s) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act.*

EPA received this official submittal with cover letter and public comments on September 25, 2006

### Water Quality Standards Attainment

*The water body's loading capacity for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards.*

The water bodies loading capacity's are defined by a load duration curve covering the range of flows for each waterbody and segment. The TMDL targets the downstream state's (Kansas) water quality standard for zinc. The target concentration for Center Creek is 0.150 mg/L total recoverable zinc (Kansas criterion) [Calculating this number using the 25<sup>th</sup> percentile hardness of 147 mg/L and the Kansas WQS yields a target of 0.166 mg/L; the TMDL target is lower than the Kansas criterion. EPA will treat this as an additional MOS]. The targeted concentration for both segments of Turkey Creek is 0.216 mg/L total recoverable zinc (Kansas criterion). Reductions range from 0 (zero) to near 100 % for LA and WLA at various flow probability ranges. The TMDL should result in the water bodies meeting water quality standards.

### Numeric Target(s)

*Submittal describes applicable water quality standards, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.*

Missouri water quality criteria for dissolved zinc are dependant on the ambient hardness concentration. This TMDL targets the criterion of the downstream state (Kansas) which is also hardness dependant but targets total recoverable zinc. The Kansas standard is calculated as acute or chronic =  $WER [exp[(0.8473 * (\ln(\text{hardness})) + 0.884]] = \text{ug/L Zinc}$

The designated uses for the impaired segments are;

Center Creek – livestock and wildlife watering, protection of warm water aquatic life, protection of human health associated with fish consumption, cool water fishery, whole body contact recreation (category A), secondary contact recreation, irrigation, and industrial.

Turkey Creek (WBID3216) livestock and wildlife watering, protection of warm water aquatic life, protection of human health associated with fish consumption, whole body contact recreation (category B)

Turkey Creek (WBID3217) livestock and wildlife watering, protection of warm water aquatic life, protection of human health associated with fish consumption, whole body contact recreation (category A)

**Numeric Target(s) and Pollutant(s) of concern**

*An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety that do not exceed the load capacity.*

The linkage between pollutant and targets are direct. The targeted pollutant causes the impairment for all the water bodies and segments in this TMDL. The criterion of the downstream state (Kansas) is used as the TMDL target.

**Source Analysis**

*Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, non point and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered.*

Mine drainage, both in the form of surface flows and resurgence of groundwater from flooded mines, contributes significant amounts of zinc to Center and Turkey creeks. Studies by the U.S. Geological Survey also indicated that pore water (water within the sediment on the bottom of Center Creek) at some locations was toxic to aquatic life. Two segments of Turkey Creek are on the 303(d) list for high levels of zinc. Several AMLs provide zinc to Turkey Creek, with the Duenweg mining area being the most significant contributor in the upper Turkey Creek watershed. In the middle portion of the watershed, the Lone Elm Hollow and Leadville Hollow areas are the most significant sources.

#### Permitted Facilities in Center Creek Watershed.

NPDES	FACILITY NAME	Design Flow	
		ft <sup>3</sup> /s	MGD
MO0002402	DYNO NOBEL, INC-CARTHAGE	14.22	9.176
MO0040185	CENTER CREEK WWTF	7.44	4.8
MO0113506	EBV EXPLOSIVES ENVIRONMEN	6.59	4.25
MO0025186	CARL JUNCTION WWTF	1.30	0.840
MO0040193	CARTERVILLE LIFT STATION	0.74	0.480
MO0028657	SARCOXIE, CITY OF	0.23	0.15
MO0002470	SPECIALTY BRANDS, INC.	0.16	0.10
MO0115169	HICKORY LANE MHP	0.03	0.022
MO0116882	COACHLIGHT RV PARK	0.01	0.007
MO0126039	WESTGATE MOBILE HOME PARK	0.01	0.007
MO0117978	ROGER HINES DUPLEX DEV WW	0.006	0.004
MO0125857	BRONC BUSTERS WWTF	0.003	0.002
TOTAL		30.75	

Note: A facility's potential WLA is calculated at design flow and is not intended to indicate the amount of zinc that is allowable under any conditions. The facility must discharge according to concentration limits in its permit

#### Point Source Discharges in Turkey Creek Watershed

Permit Number	Facility Name	Design Flow		Receiving Stream (Turkey Creek and its tributaries)
		MGD	ft <sup>3</sup> /s	
MO-0002348	Eagle-Picher Industries	3.5	5.4	Lone Elm to Turkey Cr.
MO-0102253	Fibrex Inc.	0.061	0.09	Trib to Lone Elm
MO-0111325	International Paper – Joplin	1.0	1.5	Joplin Creek to Turkey Creek/Short Creek
MO-0108731	Joplin Landfill	Stormwater		Trib to Turkey Creek
MO-0103349	Joplin/Turkey Cr. WWTF	15.0	23.25	Turkey Creek
MO-0116858	Missouri Steel Castings	Stormwater		Trib to Turkey Creek
MO-0093998	Tamko Roofing	Varies		Turkey Creek
MO-0002411	Vickers/Eaton Hydraulics	0.9	1.4	Turkey Creek/Short Cr.

Note: MGD = Million Gallons per Day; ft<sup>3</sup>/s = cubic feet per second

It appears all sources have been identified.

#### Allocation

*Submittal identifies appropriate wasteload allocations for point, and load allocations for nonpoint sources. If no point sources are present the wasteload allocation is zero. If no nonpoint sources are present, the load allocation is zero.*

LC is identified with load duration curves for both streams. Point sources are limited to the Kansas end of pipe criterion for zinc.

#### WLA Comment

Center Creek WLAs by permit. These WLAs are approved based on the table designated in-stream standard being the permit limit and the potential WLA being, in fact, the WLA as in the WLA table for Turkey Creek.

NPDES	FACILITY NAME	Design Flow		In-Stream Standard		Potential WLA	
		ft <sup>3</sup> /s MGD		ZN D mg/L	ZN TR mg/L	ZN D Lb./day	ZN TR Lb./day
MO0002402	DYNO NOBEL, INC-CARTHAGE	14.22	9.176	0.148	0.150	11.36	11.51
MO0040185	CENTER CREEK WWTF	7.44	4.8	0.148	0.150	5.94	6.02
MO0113506	EBV EXPLOSIVES ENVIRONMEN	6.59	4.25	0.148	0.150	5.26	5.33
MO0025186	CARL JUNCTION WWTF	1.30	0.840	0.148	0.150	1.04	1.05
MO0040193	CARTERVILLE LIFT STATION	0.74	0.480	0.148	0.150	0.59	0.60
MO0028657	SARCOXIE, CITY OF	0.23	0.15	0.148	0.150	0.19	0.19
MO0002470	SPECIALTY BRANDS, INC.	0.16	0.10	0.148	0.150	0.12	0.13
MO0115169	HICKORY LANE MHP	0.03	0.022	0.148	0.150	0.03	0.03
MO0116882	COACHLIGHT RV PARK	0.01	0.007	0.148	0.150	0.01	0.01
MO0126039	WESTGATE MOBILE HOME PARK	0.01	0.007	0.148	0.150	0.01	0.01
MO0117978	ROGER HINES DUPLEX DEV WW	0.006	0.004	0.148	0.150	0.00	0.01
MO0125857	BRONC BUSTERS WWTF	0.003	0.002	0.148	0.150	0.00	0.00
TOTAL		30.75				24.55	24.89

Turkey Creek WLAs by permit.

PERMIT #	FACILITY NAME	Design Flow ft <sup>3</sup> /s	Permit Limit (Daily Max)		WLA	
			ZN D mg/L	ZN TR mg/L	ZN D Lb./day	ZN TR Lb./day
MO0002348	Eagle-Picher Industries	5.4	0.19	0.216	5.6	6.3
MO0111325	International Paper	1.5	0.19	0.216	1.6	1.7
MO0002411	Vickers/Eaton Hydraulics	1.4	0.193	0.216	1.5	1.6
MO0103349	Joplin, Turkey Creek WWTF	23.25	0.19	0.216	24.2	27.1
MO0108731	Joplin Municipal Landfill	Varies	0.19	0.216		
MO0116858	Missouri Steel Castings	Varies	0.19	0.216		
TOTAL (Pounds per day)					33	37

**LA Comment**

**Center Creek loads at flow probability ranges and percent reductions required by this TMDL.**

Flow Probability Range	TMDL T Zn lb/day	Existing Load 95th Percentile lb/day	Total Reduction lb/day	PS & Seepage Reduction Percentage	LA-Runoff Reduction Percentage
60-100%	48	376	328	100%	0%
40-59%	109	1,362	1,253	30%	70%
20-39%	187	1,527	1,340	28%	72%
0-19%	443	3,750	3,307	11%	89%

The reduction in total zinc affects only load allocation (ground seepage, and runoff) at all flow probability ranges. In this calculation, WLA is maintained at 25 lb/day (see Table 2) sum for all permitted facilities.

**Turkey Creek loads at flow probability ranges and percent reductions required by this TMDL.**

Flow Probability Range	TMDL TZn lb/day	Existing Load 95 <sup>th</sup> Percentile lb/day (Cumulative Data)	Total Reduction Required lb/day	PS & Seepage Reduction %	LA Runoff Reduction %
70-100%	99	182	83	100%	0%
60-69%	158	345	187	97%	3%
40-59%	220	530	310	59%	41%
20-39%	352	1135	783	23%	77%
0-19%	796	1559	763	24%	76%

WLA is a sum of 37 lb/day.

### Margin of Safety

*Submittal describes explicit and/or implicit margin of safety for each pollutant. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided.*

The MOS for the Center Creek TMDL is implicit as expressed in the following conservative approaches:

- The hardness value chosen for target determination was the 25th percentile of all data in the watershed, which resulted in a smaller criterion value than if only data from Smithville site were used. Graphically, this option shifts the TMDL curve downward.
- The TMDL is built on data collected since 1963. As demonstrated above (Figure 2), there was a decreasing trend in zinc concentration in the watershed. This decrease in concentration over time resulted largely from better watershed management through several programs and will count toward the MOS.
- Load reduction is based on comparing the 95<sup>th</sup> percentile of existing loads within a flow probability range to the target load corresponding to the flow at mid-point of the same range. This approach yields higher reduction than if the average load of observed data was used.

An implicit MOS was used for the Turkey Creek TMDL. Conservative assumptions given are; over the period of records there is a negative trend in total zinc concentration as shown in Figure 8, on average total zinc load is lower across flow regimes during the period 2000-2004 than during 1974-1999. Since load reduction is based all available data, this trend will add to the MOS.

An additional MOS for Center Creek is given by the TMDL target of 0.150 mg/L when the calculated Kansas WQS criterion for total recoverable zinc is 0.166 mg/L.

### Seasonal Variation and Critical Conditions

*Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s).*

Concentration tends to be independent of seasons and therefore, remains constant all year-round. This is illustrated in Figure 9, using data from the Center Creek watershed. Because these TMDLs are expressed in a loading curve, a different load corresponds to every flow probability, but a constant concentration applies all year-round.

### Public Participation

*Submittal describes public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s).*

These water quality limited segments of Center and Turkey creeks are included on the approved 2002 303(d) list for Missouri. After the department develops a TMDL, it is placed on notice for public review. The 30-day public notice period for the draft Center and Turkey creeks TMDL was from May 5, 2006 to June 4, 2006. Groups that received the public notice announcement included the Missouri Clean Water Commission, affected point sources, the Water Quality Coordinating Committee, Tri-State Mining Historic District coordinators, Kansas Department of Health and the Environment, Oklahoma Department of Environmental Quality, affected Native American Tribes, the 105 Stream Team volunteers in the county and the seven area legislators. Also, the department posted the notice, the Center Creek and Turkey Creek Information Sheets and this document on its Web site, making them available to anyone with access to the Web. The department has placed a copy of the notice, the comments received and its responses in the Center and Turkey creeks file.

#### **Monitoring Plan for TMDL(s) Under Phased Approach**

*The TMDL identifies the monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used).*

To monitor the overall health of these watersheds, the Department of Natural Resources scheduled a low-flow study for 2006 for Center and Turkey creeks and their tributaries. Also, the USGS maintains annual ambient monitoring in Center Creek near Smithfield and in Turkey Creek near Joplin. To assess the impact of the point sources, the TMDL will require zinc monitoring to be included in the permits of all dischargers to these two watersheds.

As with all of Missouri's TMDLs, if continuing monitoring reveals that WQS are not being met, the TMDL will be reopened and re-evaluated accordingly. This TMDL will be incorporated into Missouri's Water Quality Management Plan.

#### **Reasonable assurance**

*Reasonable assurance only applies when reductions in nonpoint source loading is required to meet the prescribed waste load allocations.*

Reasonable assurances are not required in this TMDL. All permitted facilities in the watersheds are limited to end of pipe concentrations equal to the more stringent numeric criterion of the downstream state (Kansas).